



# WDFW and Climate Change

Washington Fish and Wildlife Commission

Lynn Helbrecht

February 8<sup>th</sup>, 2013

# FOR TODAY -- TWO QUESTIONS:

1. How will climate change affect species and habitat in Washington?

*A brief Summary of projected climate change in our region.*

2. How do we respond?

An introduction to WDFW's Climate Adaptation Program



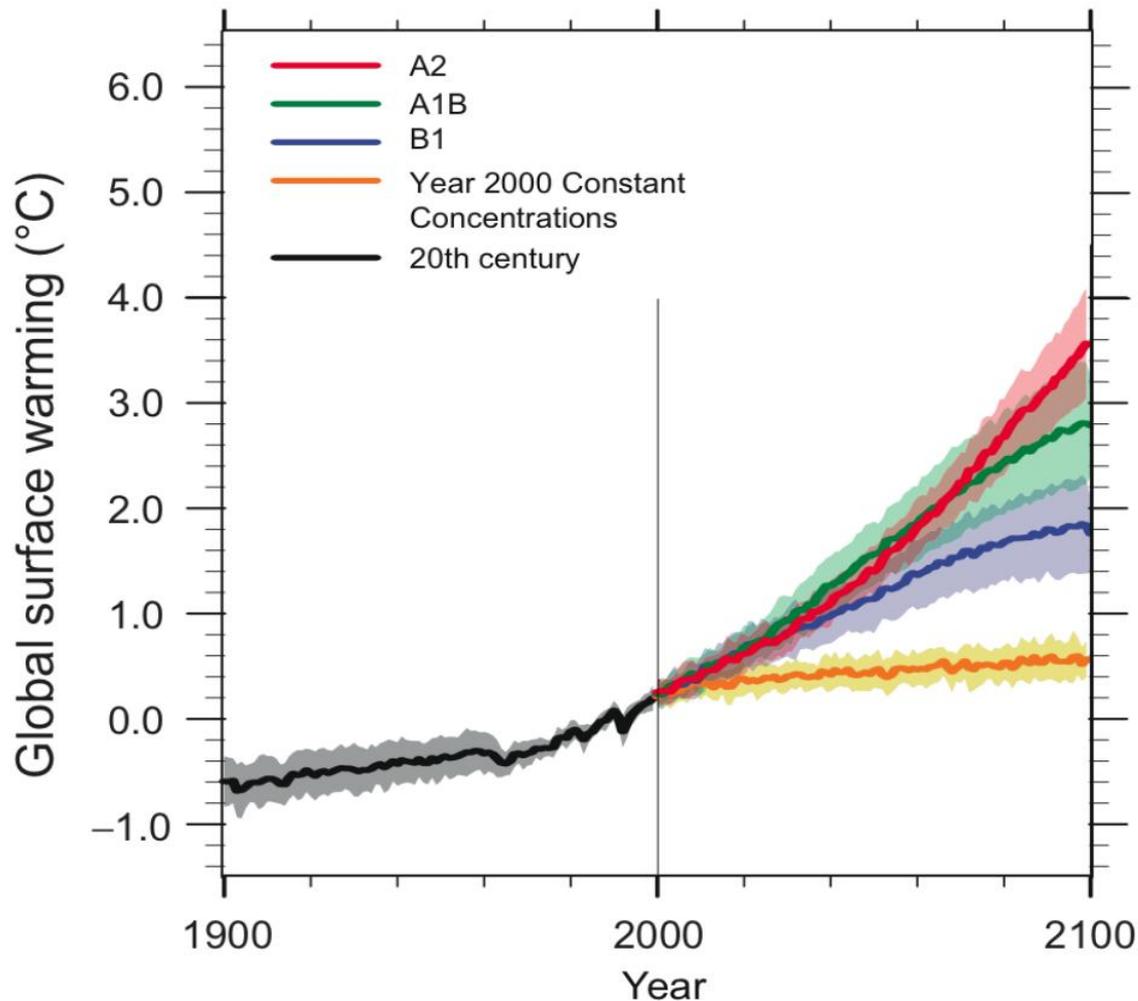
Setting the Stage for Pacific Northwest Climate Change

# GLOBAL CLIMATE CHANGE



Without drastic changes in current emissions trends, GHG concentrations will increase dramatically over the 21<sup>st</sup> century and with that, global temperature.

## Multi-model Averages and Assessed Ranges for Surface Warming



IPCC “best estimate” range of global-scale warming by the 2090s:

**3.2°F-7.2°F**

*(likely range: 2-11.5°F)*

# Sea Level is Expected to Increase



Major determinants of global sea level rise

- **Thermal expansion** of the ocean
- **Melting** of land-based ice sheets (Greenland, Antarctica)



Jakobshavn Fjord, Greenland

Global Projections for 2100:

+7 to +23 inches (*IPCC 2007*)

*and more recently*

+20 to +55 inches (*NAS, 2012*)

*Sea level will not stabilize until several centuries after global temperatures stabilize.*



Regional Impacts

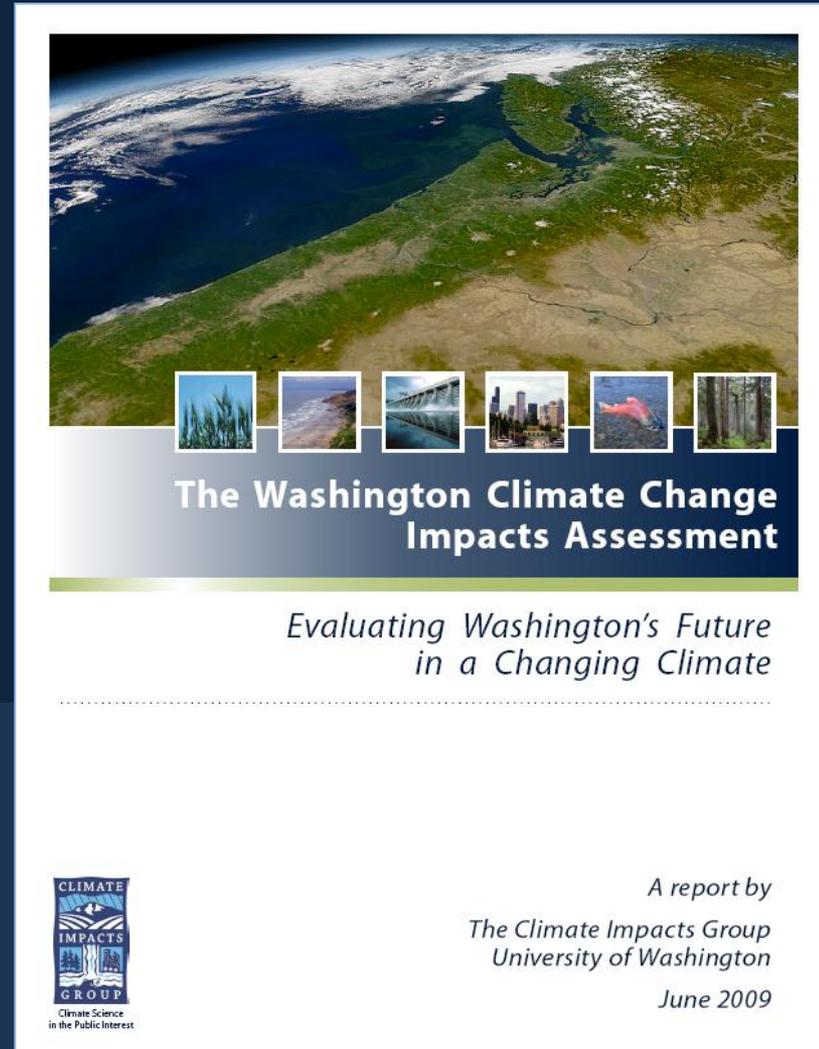
# CHANGES IN PACIFIC NORTHWEST CLIMATE

# Washington Climate Change Impacts Assessment

First comprehensive assessment of climate change impacts on Washington

Downscaled global data from 2007 IPCC reports

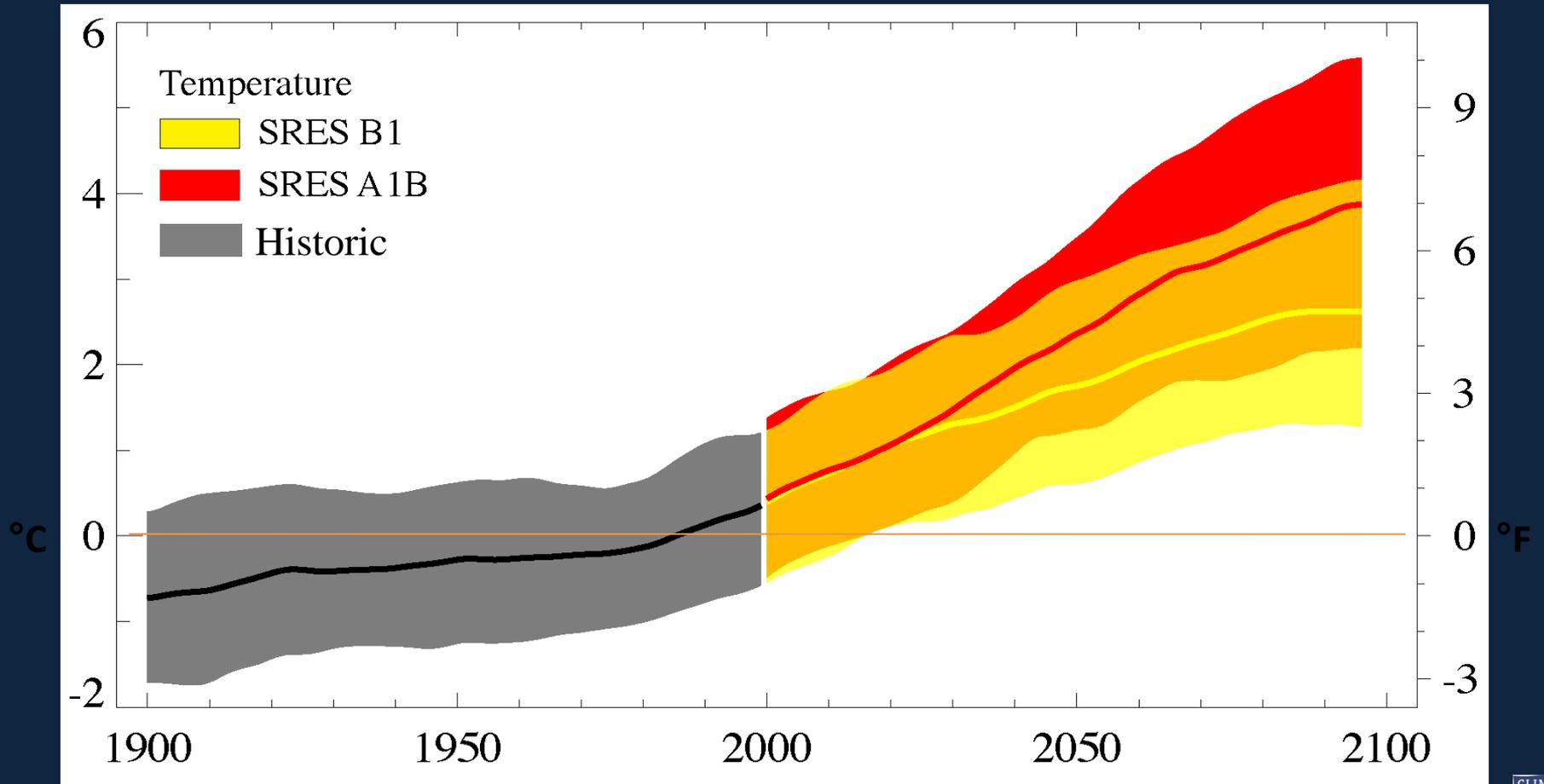
Used regional hydrology models to project changes on future snowpack, stream flow and soil moisture changes across region.



# Projected Increases in Annual PNW Temperature

\* Relative to 1970-1999 average

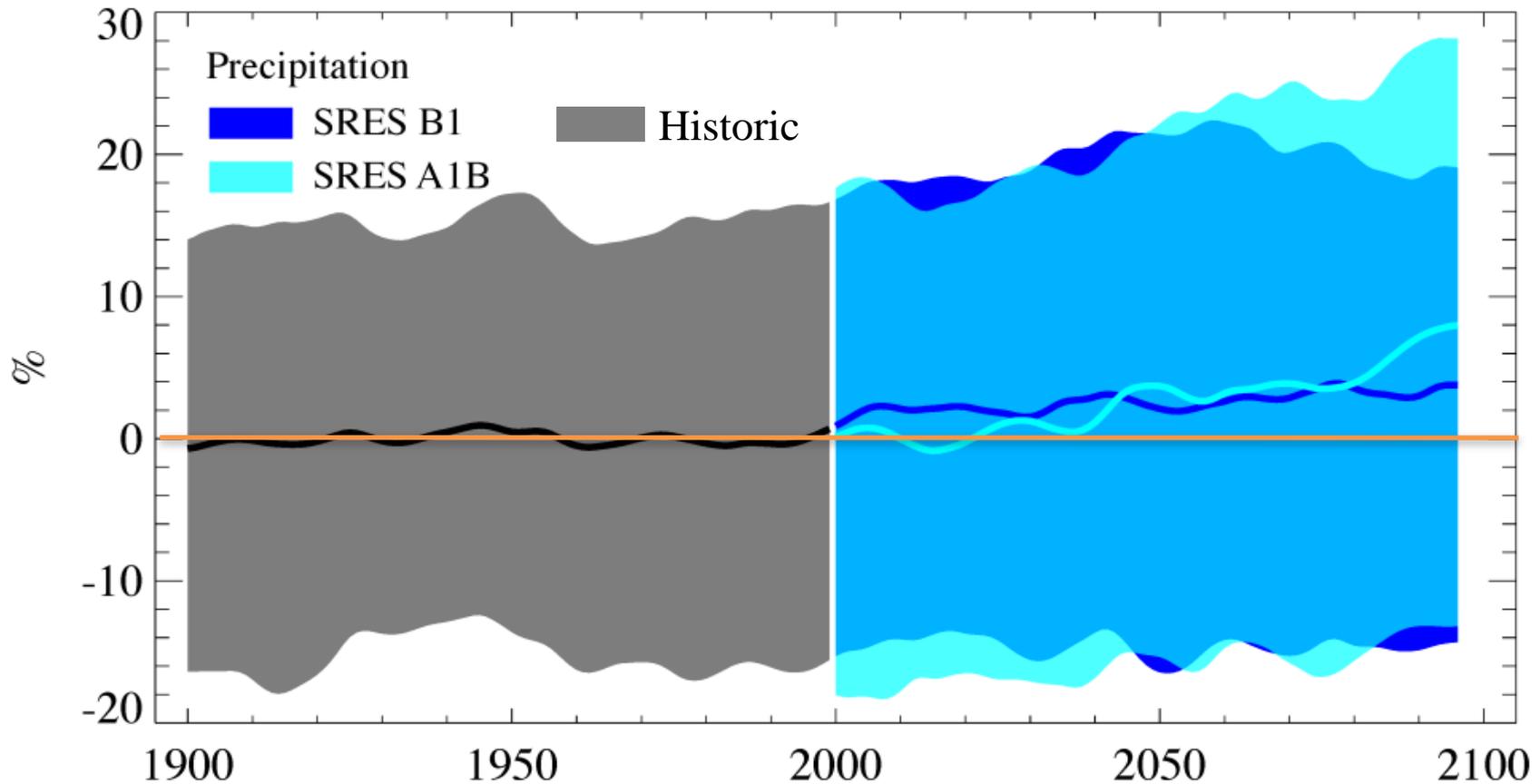
2020s	+2.0°F (1.1-3.4°F)
2040s	+3.2°F (1.6-5.2°F)
2080s	+5.3°F (2.8-9.7°F)



# Projected Increases in Annual PNW Precipitation

\* Relative to 1970-1999 average

2020s	+1% (-9 to 12%)
2040s	+2% (-11 to +12%)
2080s	+4% (-10 to +20%)





Hydrologic Impacts

# PROJECTED CHANGES IN PACIFIC NORTHWEST HYDROLOGY



Expected 21<sup>st</sup> century changes in temperature and precipitation will *transform* the hydrologic behavior of many mountain watersheds in the West, largely due to:

1. Loss of spring snowpack
2. Changes in timing of streamflow



Aquatic and Terrestrial Environments

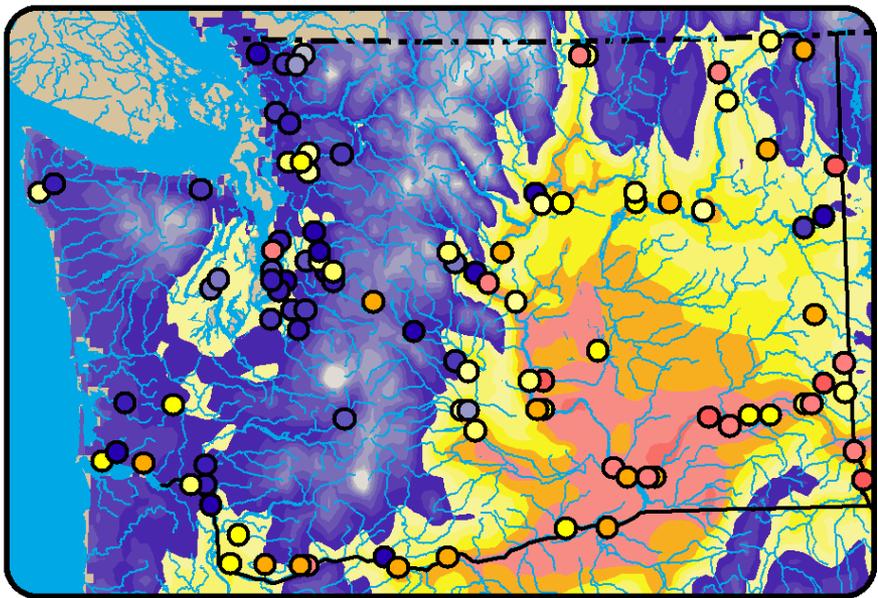
# PROJECTED CHANGES IN AQUATIC AND TERRESTRIAL ECOSYSTEMS AND SPECIES

# Salmon and Aquatic Ecosystems

August Mean Surface Air Temperature and Maximum Stream Temperature

Historical (1970-1999)

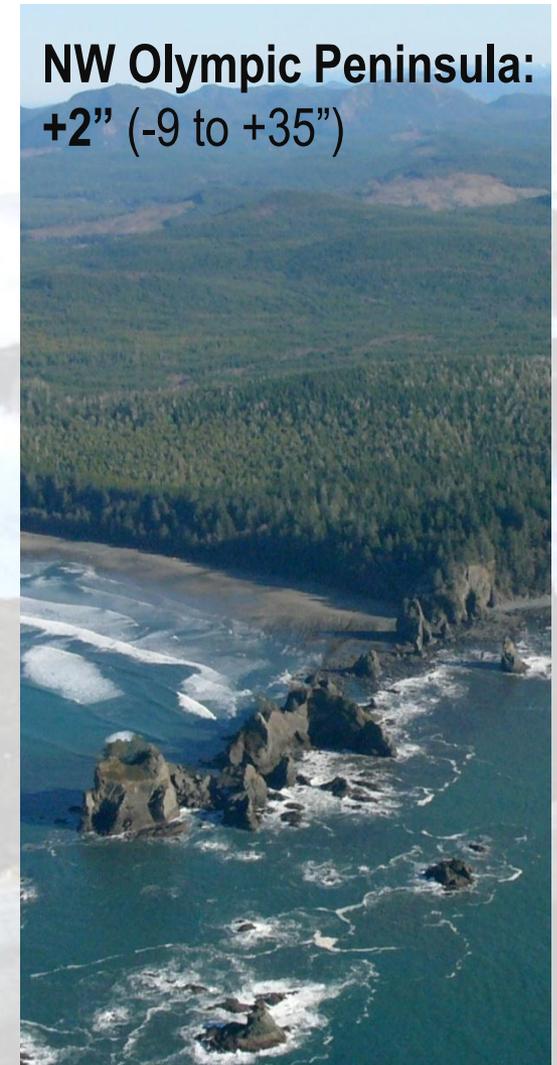
2040s medium (A1B)



\* Projections are compared with 1970-1999 average

# Washington State Sea Level Rise

**Medium** (w/range) estimates of sea level rise in Washington for **2100**:



# Near-term Challenges of SLR

Sea level rise increases storm surge and the risk of:

- flooding
- erosion
- habitat loss

These impacts will affect coastal areas *long before permanent inundation.*



# Ocean Acidification -- *related to but distinct from climate change*

- Lowering of ocean pH from the absorption of CO<sub>2</sub> from the atmosphere.
- More acidic conditions can reduce calcification in shellfish and other organisms.
- The current rate of acidification is nearly 10 times faster than any time in the past 50 million years



# Challenges to Species, Habitats and Ecosystems

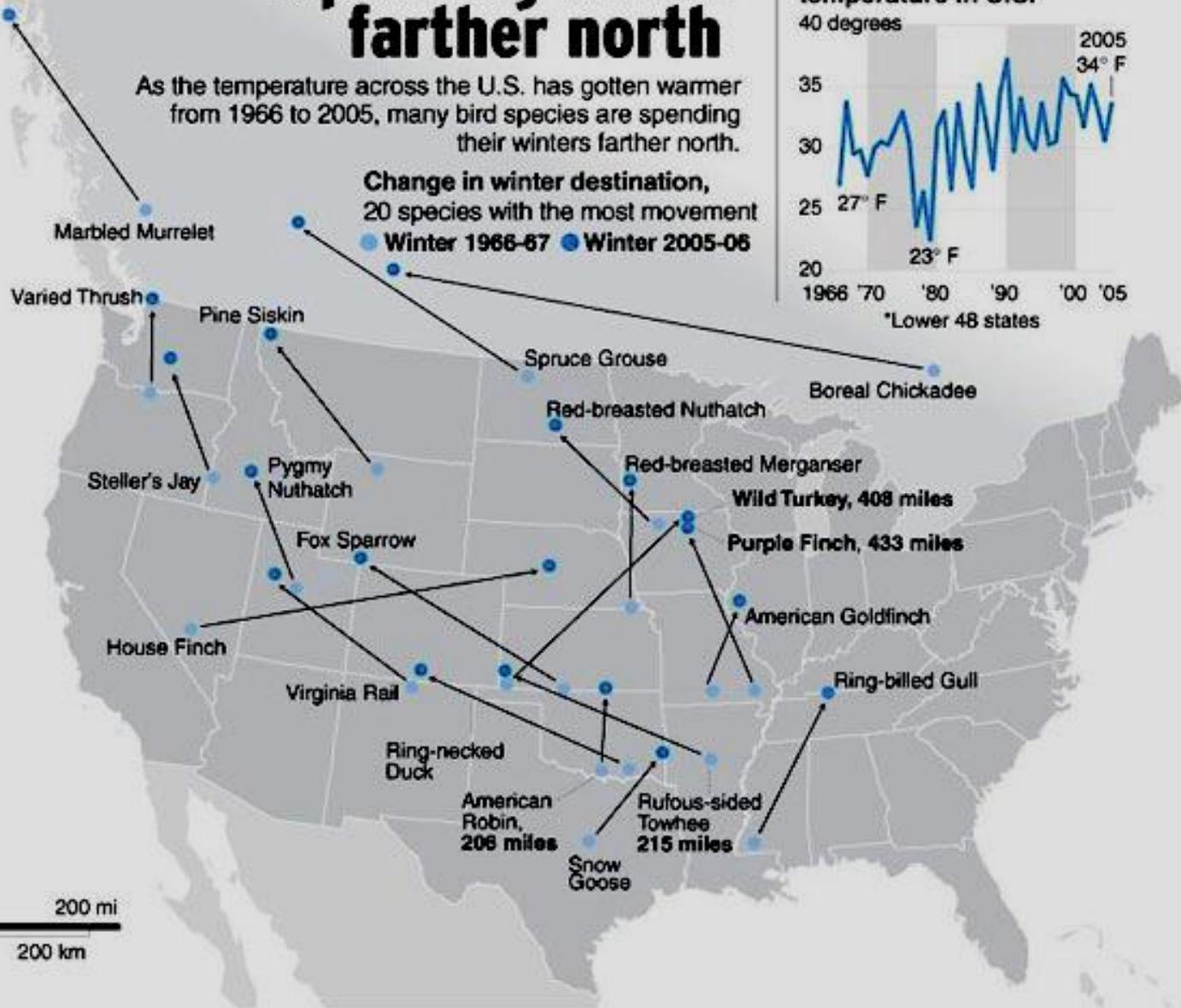
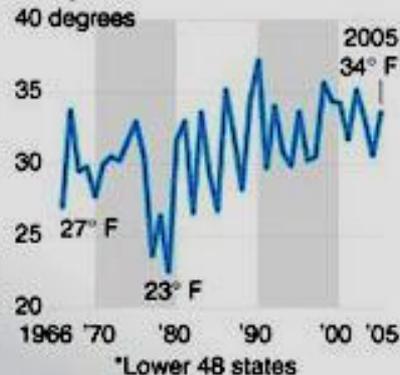


# Spending winter farther north

As the temperature across the U.S. has gotten warmer from 1966 to 2005, many bird species are spending their winters farther north.

**Change in winter destination, 20 species with the most movement**  
 ● Winter 1966-67 ● Winter 2005-06

Average January temperature in U.S.\*



# How will climate change affect WDFW?

- **Acquisition** of new lands for habitat
- **Restoration projects** – will our investment continue to provide expected benefits over time?
- **Technical Assistance projects** – are we providing appropriate guidance for marine and riparian areas?
- **Species management and recovery** for climate sensitive species.
- **Permitting** – are we adequately considering the risk of increased flows?
- **Infrastructure**; culverts, roads, hatcheries, stream crossings.

# PART II – HOW DO WE RESPOND?

# Clarifying the terms for Climate Change Response

**MITIGATION:** A human intervention to reduce the source, or improve the uptake (sinks) of greenhouse gases.

**ADAPTATION:** An adjustment in natural or human systems in response to expected climatic changes – to minimize harm or take advantage of beneficial opportunities.

Planning for adaptation is the closest thing we have to an insurance policy for protecting our investments from the effects of climate change



# WDFW: responding to the challenge of climate change

## SCIENCE

Assessing the vulnerability of fish, wildlife and their habitat to climate change

## EDUCATION

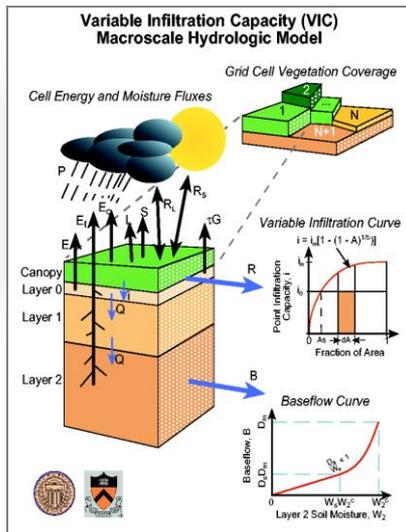
Building our capacity to respond

## INTEGRATION

Identifying adaptation opportunities and integrating to our core work

## COLLABORATION

With agencies, tribes and conservation partners

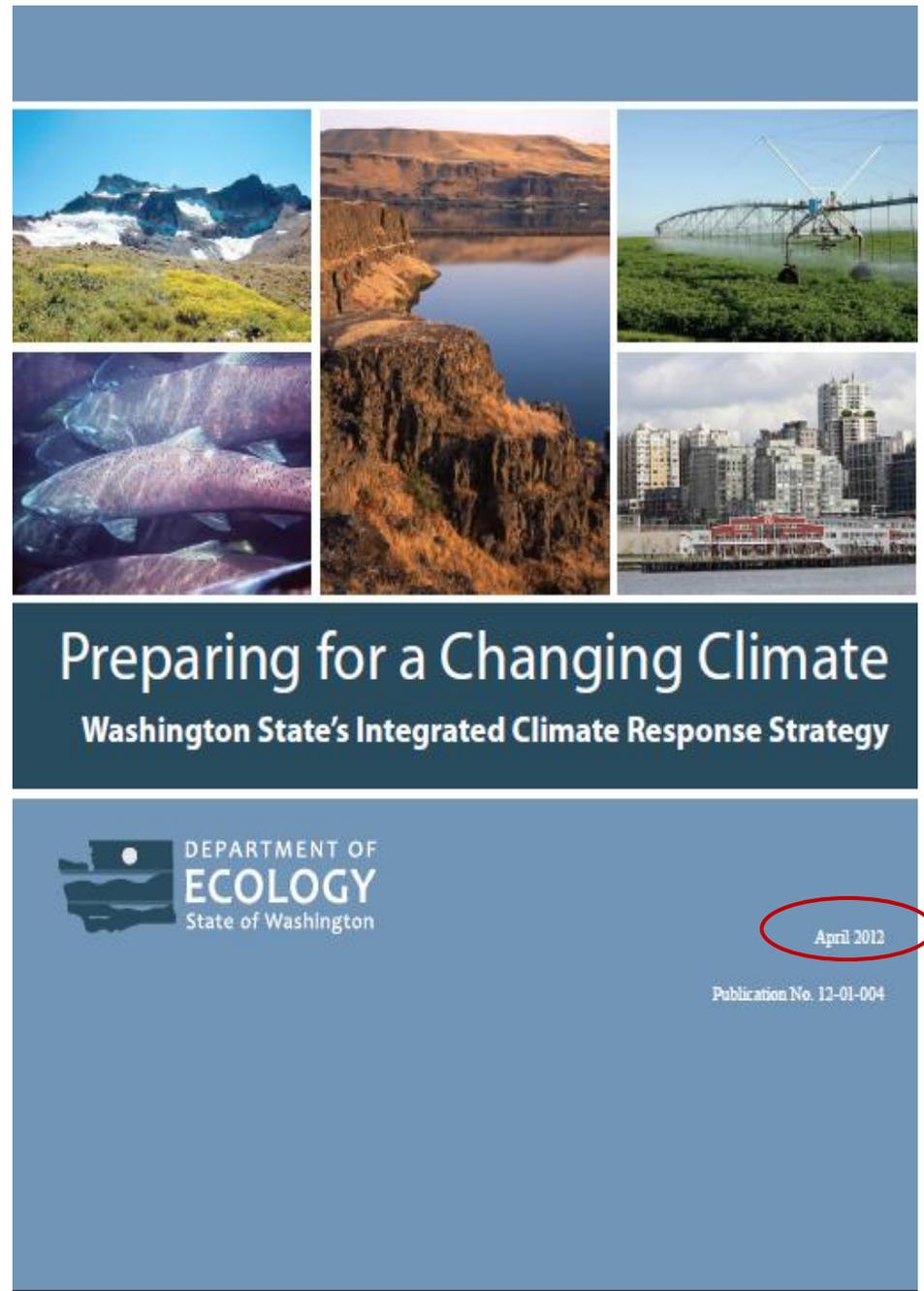


## WDFW Strategic Goals for Climate Change

- Drive conservation at broad landscape scales in response to a changing climate
- Provide education for employees and the public regarding the implications of climate change for fish, wildlife and habitats.
- Build on existing and develop new partnerships

WDFW lead a stakeholder advisory group to develop recommendations for fish, wildlife and plants for the **Washington State Integrated Climate response Strategy.**

Prepared in response to 2009 state legislation – the Climate Leadership Act



Preparing for a Changing Climate  
Washington State's Integrated Climate Response Strategy



April 2012

Publication No. 12-01-004

# Washington's Climate Change Response Strategy

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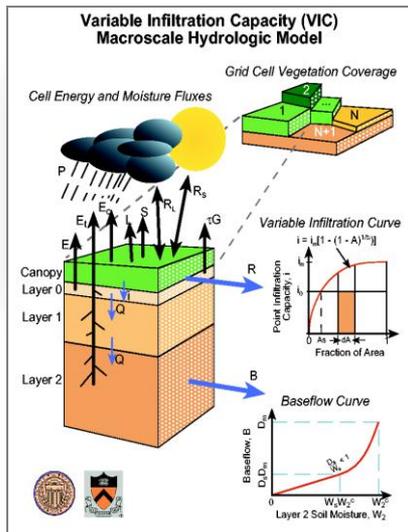
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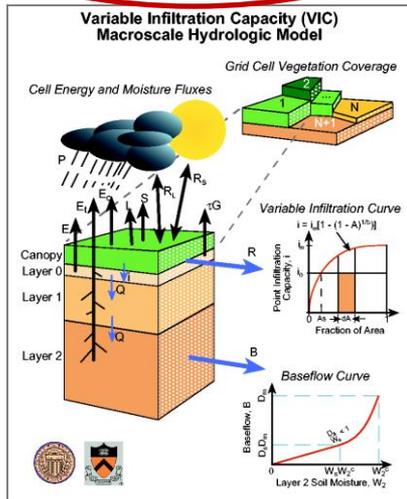
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# Examples of Climate Science at WDFW

- Pacific Northwest Climate Change Vulnerability Study [in progress]

# Pacific Northwest Climate Change Vulnerability Assessment



Designed to answer the questions:

Which species and systems are most sensitive to climate change?

Which places are likely to see the most change?

Which species and systems will be able to adapt?

How can managers use this information to inform their work?

Partners: USGS, UW, TNC, WDFW, IDFG, U of I, NWF

Results and Data can be found at: <http://www.climatevulnerability.org/>

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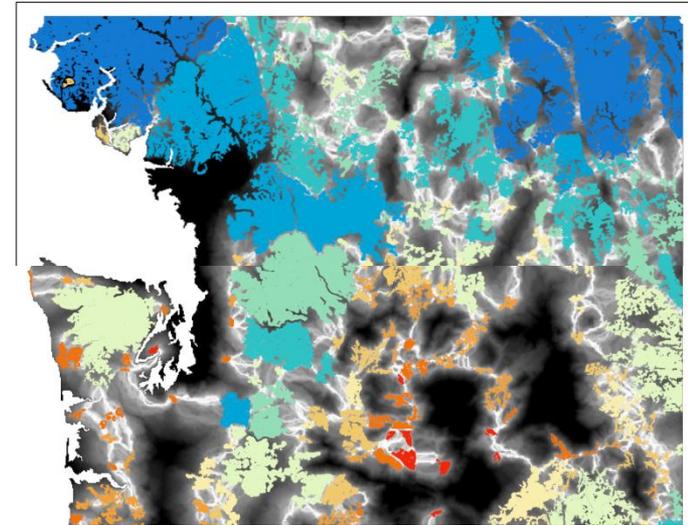
- Pacific Northwest Climate Change Vulnerability Study [in progress]
- **Washington Habitat Connectivity Working Group – Identifying Climate Gradient Corridors [completed]**

# Climate Gradient Corridors Analysis

Statewide product identifies areas for species to move from warmer to cooler temperatures.

## KEY ASSUMPTIONS

1. Species ranges will move to track suitable climates.
2. Climatic gradients between core areas will remain largely constant.
3. Species range shifts will be more likely to occur through natural areas.



# Examples of Climate Science at WDFW

- Pacific Northwest Climate Change Vulnerability Study [in progress]
- Washington Habitat Connectivity Working Group – Identifying Climate Gradient Corridors [completed]
- **Prioritizing Riparian Connectivity Areas (in collaboration with WGA) [in progress]**
- **Identifying key elements of topographical diversity for climate resilience (in collaboration with WGA) [in progress]**



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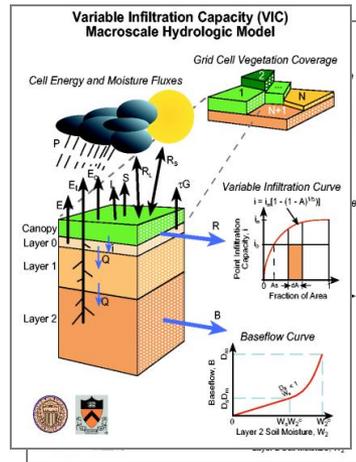
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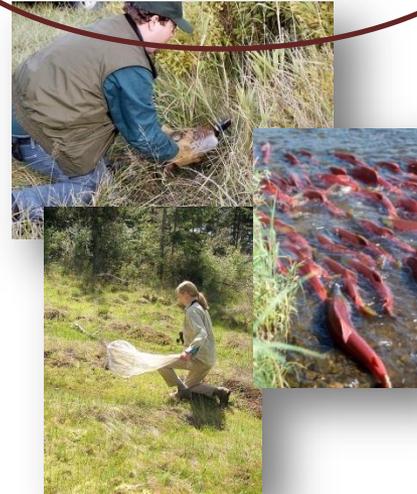
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# WDFW Climate Adaptation Handbook

*Develop guidance for staff on integrating climate considerations into agency projects and key decisions.*

Pilot projects include:

- Grant guidance and evaluation.
- Restoration project design and implementation.
- Reviewing culvert design guidance.
- Hatchery infrastructure
- State Wildlife Action Plan

# SUMMARY

1. Climate change is already impacting species and habitat quality.
2. There are actions we can take to prepare and respond - “no regrets” strategies.
3. Building our capacity for strategic adaptation will help insure success at meeting our conservation goals.



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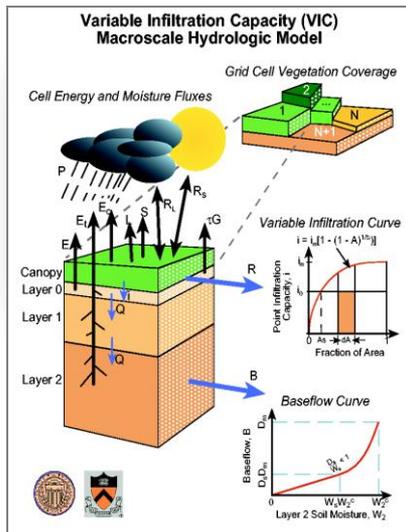
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Lynn Helbrecht  
Climate Change Coordinator  
WDFW  
902-2238  
[Lynn.helbrecht@dfw.wa.gov](mailto:Lynn.helbrecht@dfw.wa.gov)

